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(71) Applicant
Noel Joseph Goom
Dollo House, The Beeches, Nantwich, Cheshire, CW5 5YP, United Kingdom

(72) Inventor
Noel Joseph Goom

(74) Agent and/or Address for Service
Noel Joseph Goom
Dollo House, The Beeches, Nantwich, Cheshire, CW5 5YP, United Kingdom

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B60V 1/00 1/06

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B7K KC KDC KDX
U1S S1898

(56) Documents cited
GB 1167426 A US 3825093 A US 3796279 A
US 3756342 A US 3055446 A

(58) Field of search
UK CL (Edition K) B7K KA KC KDA KDC KDX
INT CL[5] B60V 1/00 1/06 1/16, B65G 7/06
On-line database: W.P.I.

(54) Load transfer pallet or platform

(57) A pallet or platform for transferring loads from one surface to another surface, supported by a plurality of plenum chambers 13 beneath the carrying surface, each plenum chamber 13 having a flexible skirt 3 releasibly attached to the supporting beams 2, being capable of independently receiving and containing compressed air, from a source located externally of the pallet, so that an independent air cushion can be formed in each plenum chamber 13 to provide support for any load carried on the pallet. The pallet is fitted with devices for separately controlling the air flowing from a single external source, to each of the plenum chambers, to facilitate the alignment of the pallet with the supporting surface, and devices for connecting the pallet with the external supply of air, and means of propulsion.

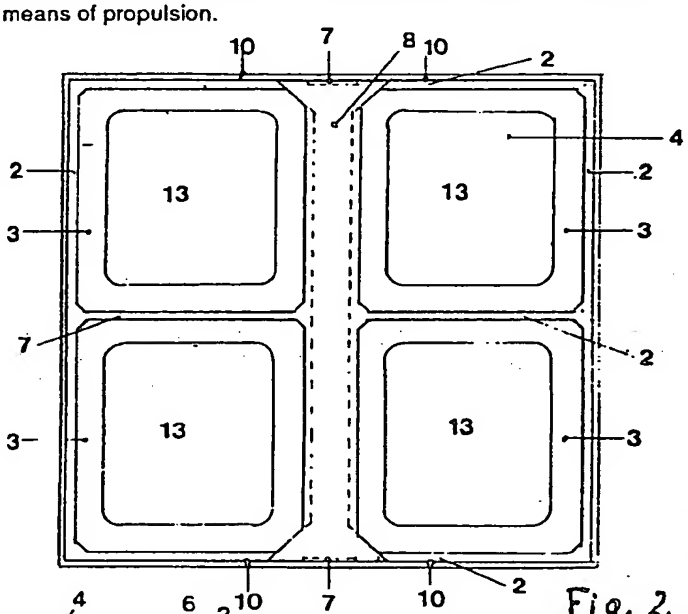

Fig. 2

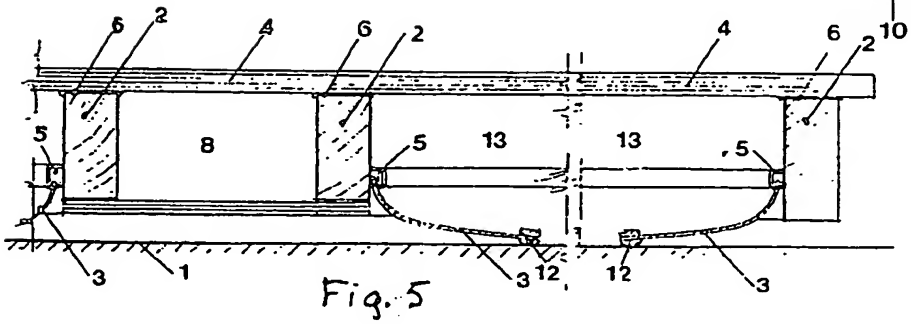

Fig. 5

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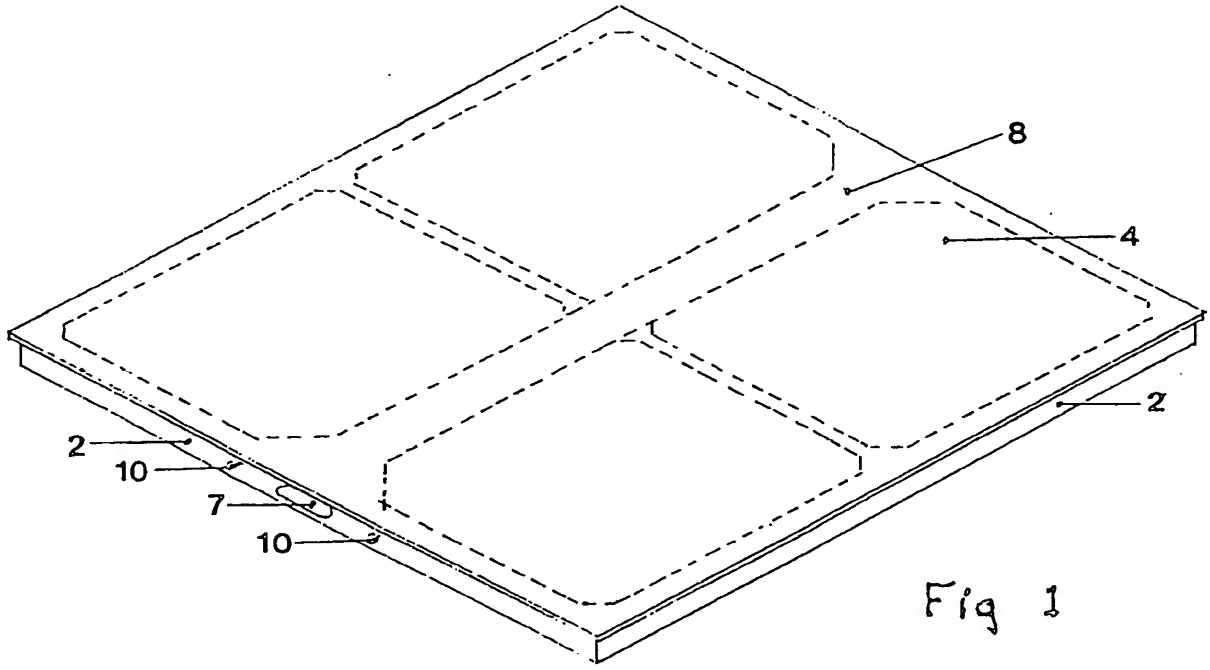

Fig 1

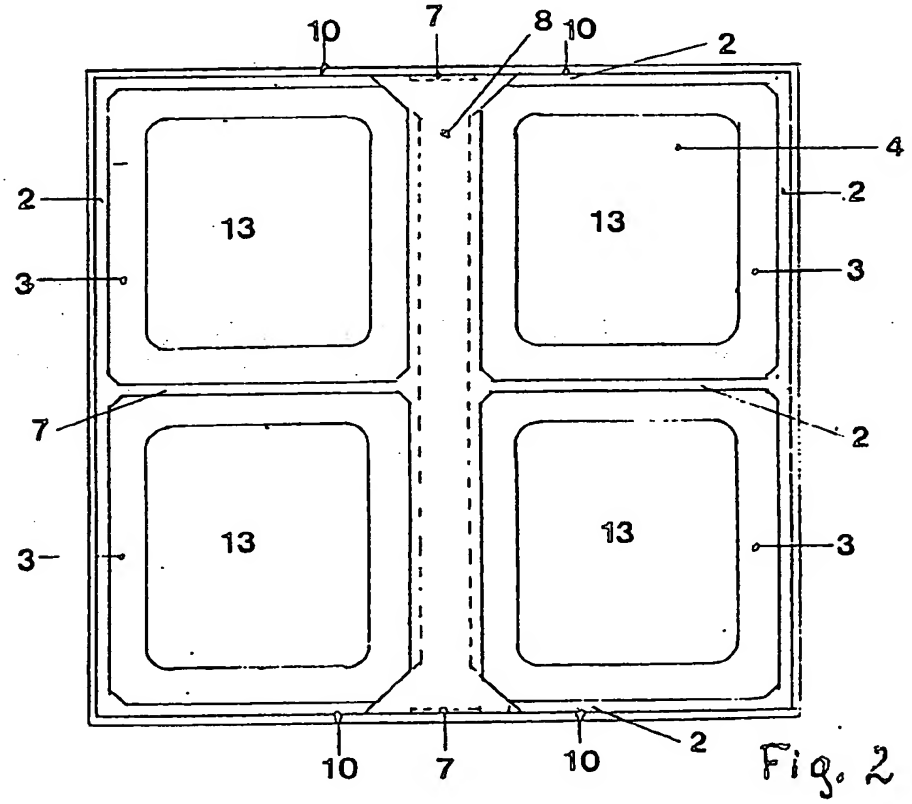

Fig. 2

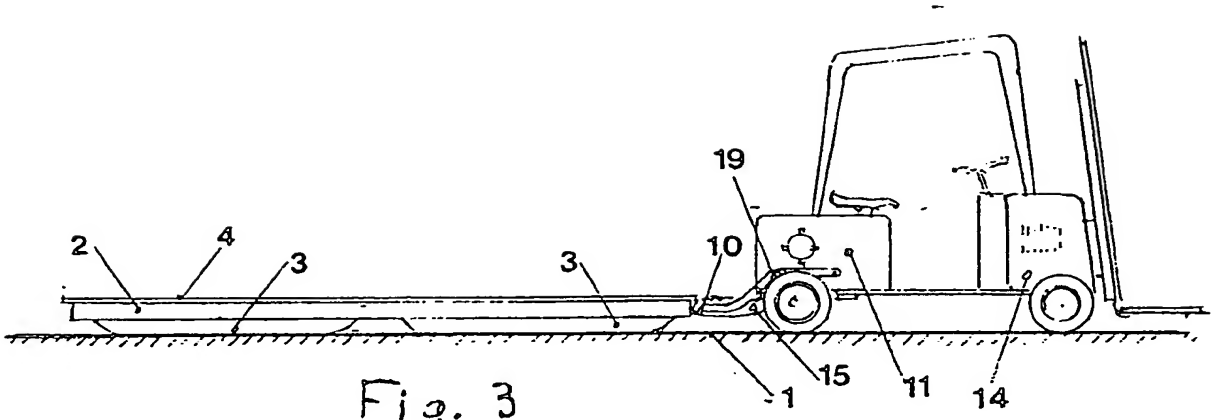

Fig. 3

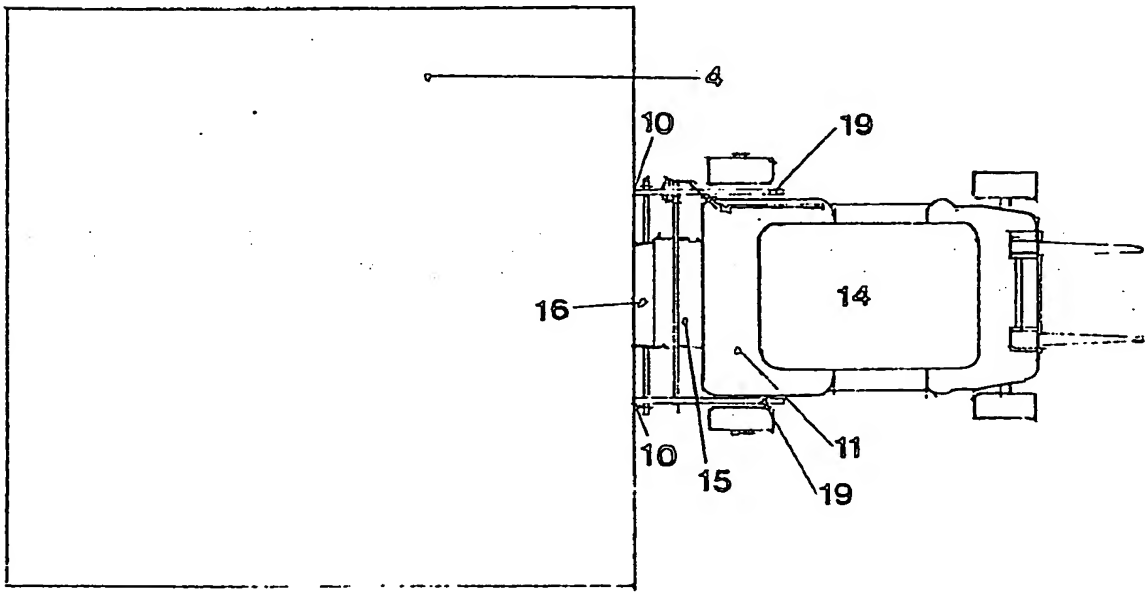

Fig. 4.

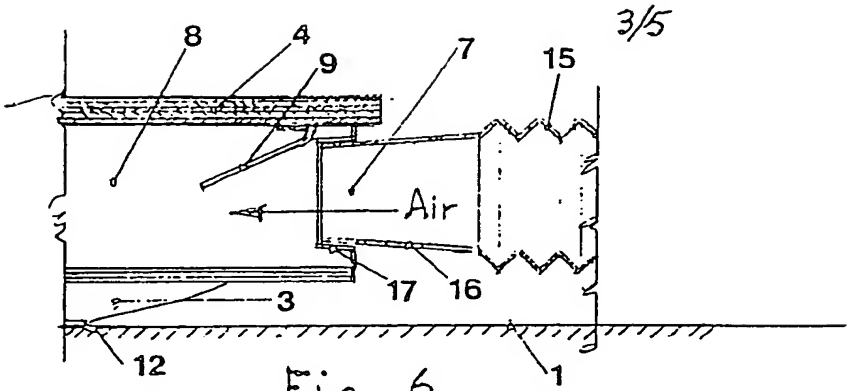

Fig. 6

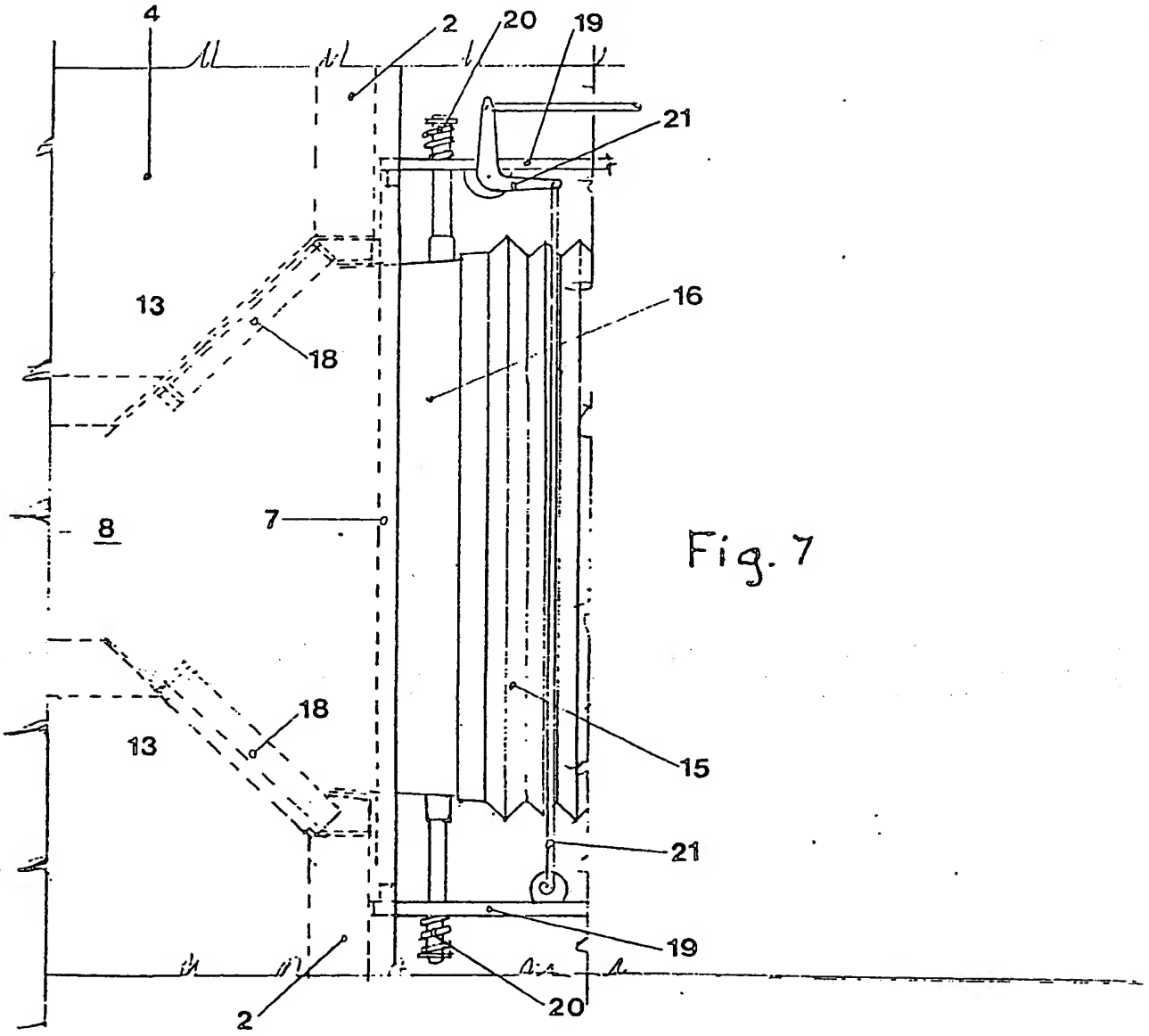

Fig. 7

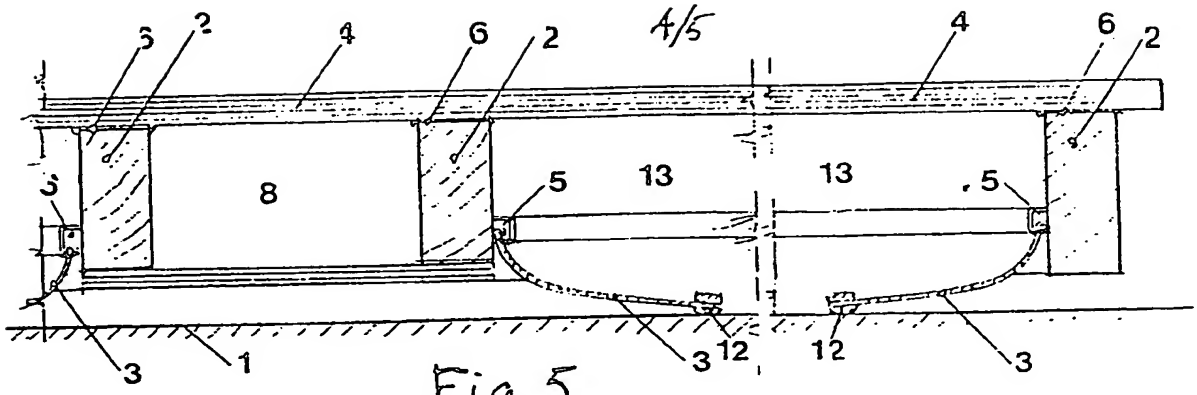

Fig. 5

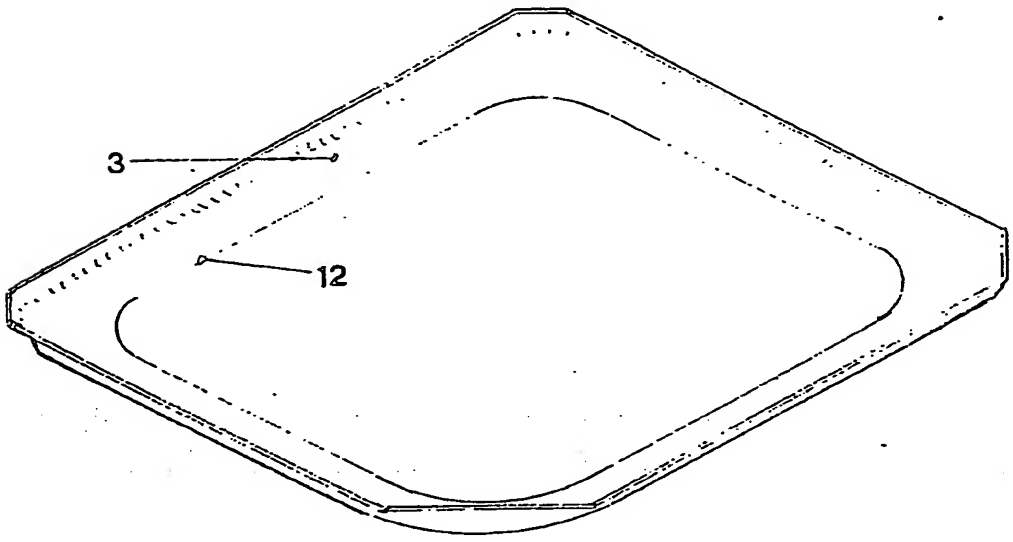

Fig. 8

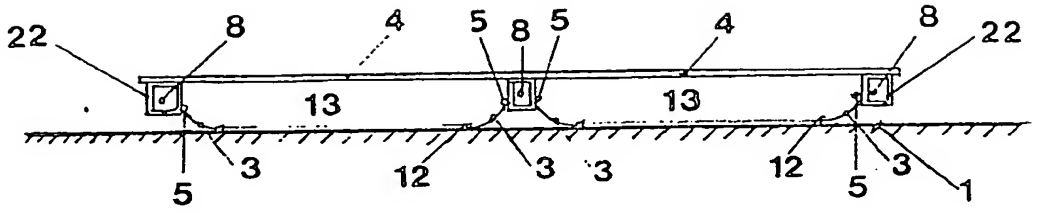
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Fig. 9

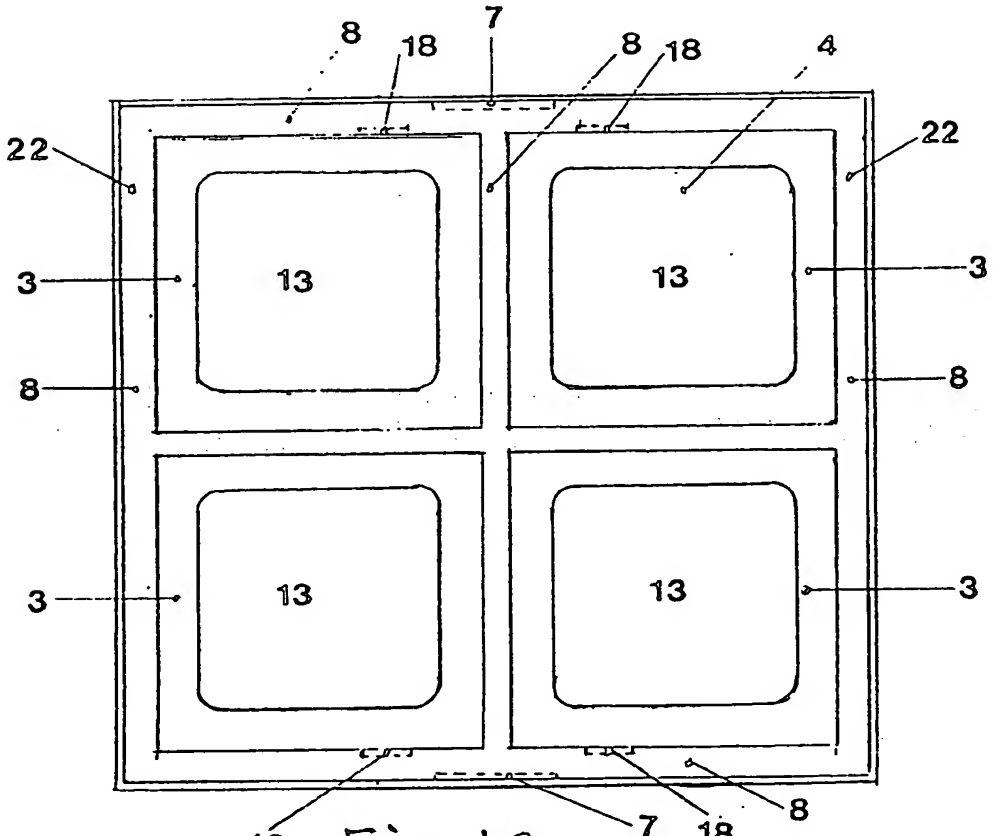
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Fig. 10

I Noel Joseph Goom, of Nantwich in the County of Cheshire, do hereby declare the invention, for which I pray that a patent may be granted to me , and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to air cushion supported pallets or platforms used for transferring loads from one position to another position or from one surface to another surface, whereby the surfaces may relate to the ground, the carrying surfaces of road vehicles, railway trucks, coaches , wagons, aircraft or sea going vessels.

Wooden pallets of very simple construction are in common use as an aid to loading and unloading motor vehicles, and moving loads in factories and buildings. They improve the speed of handling because they enable items to be moved in larger numbers stacked loosely on the pallets. The pallets are handled by fork lift trucks which can be of any size. The pallets can be of any size but in practice their size has been limited to around 1200mm x 900mm with a weight limit of around one tonne. The limits have been established by a combination of circumstances but significantly by the inability of fork lift trucks to carry large loads eccentrically without exceptional balancing weight in the fork lift truck, and a consequent doubling of the total weight of truck and load.

The cost of manufacturing the pallets significantly affects their use in transporting goods. If the cost of returning the pallet to the sender is prohibitive then their cost must be included in the cost of transportation and if, as a consequence of the "single market" in 1992, the length of journey increases then the cost of returning them must increase. It

follows therefore that the cost must be kept to a minimum.

The handling of loads to be transported overseas can similarly be speeded up by transferring goods in larger numbers, but because of the necessity to transfer the loads from one mode of transport to another, i.e. from the road vehicle which is the means of distribution, to the railway, or to the ship, or to both, heavy containers are required. The use of containers is also necessary for the transport of small items by rail and air. Very heavy and specialised lifting gear is required to handle containers and the cost of returning them, possibly empty, is very expensive.

An object of this invention is to provide an improved and more economical means of transferring loads between road and railway vehicles and between other means of transport and within factories by providing a modified pallet construction incorporating air cushions.

A further object of the invention is to provide a means of transferring loads substantially larger and heavier than the limits imposed by the use of existing pallets and fork lift trucks, by providing a pallet constructed in a similar manner and of similar materials to those pallets presently in use but supported on a plurality of air cushions. They would be moved and manipulated by vehicles which may be fork lift trucks similar in size and equipment to those used for existing pallets, whereby they would retain the ability to handle the modified pallets as well as existing pallets, but may also be some other form of tractor, equipped with a means of supplying air to the pallet at a pressure greater than atmospheric pressure for the purpose of raising and maintaining the pressure of the air in the plenum chambers. The modified pallets would have

the advantage of the greater manoeuvrability inherent in the use of air cushions.

Air cushion devices to assist the movement of loaded pallets have already been suggested but their use has been restricted to specialised circumstances and situations without the benefit of the economy of construction , facilities for stability control, and the quick and easy connection to the air supply and propulsive unit, provided by this invention.

A characteristic of air cushion pallets is the difficulties encountered in dealing with asymmetrical loading of the pallet. This becomes more significant as the size of the pallet increases.

Earlier air cushion pallets are, in general, provided with both primary and secondary air chambers . More particularly such pallets are provided with a primary plenum chamber peripheral to and containing air at a greater pressure than that in the secondary plenum chamber. The primary chamber, in the form of a torus, acts in the manner of a skirt to contain the air within the secondary chamber and offers resistance to the imbalance caused by the asymmetrical loading of the pallet as a consequence of the greater pressure of the air in the primary chamber to that in the secondary chamber. To achieve stability by means of primary and secondary chambers the air cushion supported load carrying platforms need to have on their underside a plurality of diaphragms which define the cushions of pressurised air by which the platform is supported. Each diaphragm defines a first chamber between the diaphragm and the platform and a second chamber, or cushion area, between the diaphragm and the surface over which the platform is operating. Both chambers may be inflated from the same source. The construction of air cushion supported pallets incorporating primary and secondary chambers, as described, is more complicated and thus more expensive than the single chambers as provide by this invention

and could be prohibitive if they were to be incorporated into pallets which were to be non-returnable.

Air cushion supported load bearing platforms with primary and secondary chambers are described in GB2092084A, GB1551715A, GB1243212A, GB1258243A, GB1210261A, and US3161247.

In the present invention control of asymmetrical loading is achieved by providing air, which may be from a single source, to a plurality of independent air cushions, whereby the pressure of air in each cushion may be separately controlled.

According to this invention I provide a pallet or platform for transferring loads from one position to another position, or from one surface to another surface, whereby the surfaces may relate to the ground, the carrying surfaces of road vehicles, railway trucks, coaches , wagons, aircraft or sea going vessels, comprising a rigid sheet upon which the load is carried, beams or tubular members attached to the underside of the rigid sheet for the purpose of supporting the rigid sheet, which beams or tubular members are so arranged as to form, in part, a plurality of plenum chambers beneath the rigid sheet, each plenum chamber having a perimeter defined by a flexible skirt releasible attached to the lower edge of the inner faces of the supporting beams or tubular members and upper and lower surfaces defined by the underside of the rigid sheet and the surface over which the pallet is operating, each plenum chamber being capable of independently receiving and containing within the chamber, compressed air, from a source of air, at a pressure greater than atmospheric pressure, located externally of the pallet so that an independent air cushion can be formed in each plenum chamber to provide support for any load carried on the rigid sheet.

A modification of this invention provides supporting beams or tubular members

arranged beneath the load bearing rigid sheet as to form a duct or ducts, within their own depth, for the containment of the air supply to the plenum chambers and the means of regulating the volume of air to each of the plenum chambers. The load carrying rigid sheet and supporting beams or tubular members may be constructed of timber, plastic, metal, or other suitable materials.

To assist in the propulsion and guidance of the of the air cushion supported load carrying pallet, quick release attachments may be provided on the pallet to secure the pallet to the fork lift truck or other means of transport, such attachments may also incorporate the means of supplying pressurised air from a compressor on the vehicle to the air cushions supporting the pallet.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 shows an isometric sketch of the invention in the form of an open platform.

Figure 2 shows a plan of the underside of the invention.

Figure 3 shows a side elevation of the invention attached to a fork lift truck upon which a fan compressor has been mounted.

Figure 4 shows in plan the method of attachment of the invention to a fork lift truck.

Figure 5 shows, in part section, and to a larger scale, a cross section through the invention showing an example of the air duct, and a method of attaching the skirt to the internal faces of the supporting beams.

Figure 6 shows, in cross section, a method of attaching the air supply to the invention.

Figure 7 shows, in plan view, a method of attaching the invention to the propulsive vehicle, and a method of attaching the air supply.

Figure 8 shows in an isometric view, a typical shape for a renewable skirt which is attached to the inner faces of the supporting beams forming one of the plenum chambers.

Figure 9 shows a section through the invention where tubular sections are used to form supporting members attached to the under side of the load carrying rigid sheet.

Figure 10 shows a plan view of the underside of the invention where tubular members are used to form the supporting members.

Although various embodiments are described herein and illustrated in the drawings, the invention is not to be considered as limited thereto, and modifications can be made which are within the scope of the appended claims. For example the air cushion pallet as above described may have a permanently or temporarily mounted container attached thereto. The container may have means for creating cold storage. The pallet may have a framework superimpose upon it to support a waterproof covering. The means of inflating the cushions may be by some other gas or fluid.

Referring to the drawing, the invention comprises a platform in the form of supporting beams 2 supporting a rigid sheet 4 which may be manufactured in timber or other material. The rigid sheet 4 may be reinforced as necessary to support the loads it is designed to carry. The supporting beams 2 and rigid sheet 4 may be manufactured in timber but may also be made

of metal, plastic, or other material. The rigid sheet 4 is permanently secured to the supporting beams 2 with air tight joints 6.

Apertures are provided on one or more sides 7, to permit the entry of air at a pressure greater than atmospheric pressure, into the air supply duct or ducts 8. The entry or entries are fitted with self sealing flap valves 9 to maintain the pressure in the duct or ducts when another entry point is being used .

Attachment points 10 are used to secure the fork lift truck to the pallet.

The air cushions are contained in the plenum chambers 13 formed between the underside of the rigid sheet 4, the beams 2, the flexible skirt 3, and the supporting surface 1.

A renewable flexible skirt 3, defining each plenum chamber 13, is attached to the inner faces of the supporting beams 2, at the lower edge of the beams 2 , by means of a continuous clamp 5. The flexible skirt 3, is forced against the supporting surface 1, by the pressure of air in the plenum chambers 13, and an air cushion is formed in each chamber thus supporting the load carrying pallet. An abraision resistant strip 12, is attached to the flexible skirt 3, along the edge next to the supporting surface 1.

An external source of air under pressure is required and some external means of propulsion and directional control are required for the operation of a loaded pallet. In the example shown in the drawings, the external requirements are provide by a fork lift truck 14 on which is mounted a fan compressor 11.

The attachment used to connect the air supply to the pallet is shown in Figure 7, where air under pressure enters from the external supply 11, through the flexible connection 15, into a tapered tube 16, which

is matched in shape and taper, concentrically, by a similar tube 17, attached to and forming the entry to the duct 8, supplying air to the plenum chambers 13. A releasable locking device secures the connection whilst the pallet is being moved.

A control device 18, in the form of a blind or shutter, capable of adjustment from outside the duct and whilst the pallet is loaded, is fitted between the air supply duct or ducts,and each plenum chamber whereby the volume of air supplied to each plenum chamber can be separately controlled, thus enabling the pallet to be balanced when eccentric loads are being carried.

Two arms 19, attached to the fork lift truck and arranged to pivot in a vertical plane, and to a limited extent in the horizontal plane, can be widened horizontally against the pressure of two springs 20, by a system of levers 21, or by hydraulic means, to engage, when released, with the attachment points 10, on the pallet. The arms 19, can be raised or lowered individually, or collectively, when required, by mechanical or hydraulic means, to facilitate the engagement of the air supply 16, and the connecting arms 18.

What I claim is :-

1. A pallet or platform for transferring loads from one position to another position, or from one surface to another surface, whereby the surfaces may relate to the ground, the carrying surfaces of road vehicles, railway trucks, coaches , wagons, aircraft or sea going vessels, comprising a rigid sheet upon which the load is carried, beams or tubular members attached to the underside of the rigid sheet for the purpose of supporting the rigid sheet, which beams or tubular members are so arranged as to form, in part, a plurality of plenum chambers beneath the rigid sheet, each plenum chamber having a perimeter defined by a flexible skirt releasibly attached to the lower edge of the inner faces of the supporting beams or tubular members and upper and lower surfaces defined by the underside of the rigid sheet and the surface over which the pallet is operating, each plenum chamber being capable of independently receiving and containing within the chamber, compressed air, from a source of air, at a pressure greater than atmospheric pressure, located externally of the pallet so that an independent air cushion can be formed in each plenum chamber to provide support for any load carried on the rigid sheet.

2. An air cushion supported load carrying pallet or platform as described in Claim 1, with a plurality of plenum chambers attached to the underside of the load carrying rigid sheet, each plenum chamber being defined by flexible skirts of plastic or rubberised or other suitable material, releasably attached to the supporting beams or tubular members attached to the underside of the load carrying rigid sheet and so arranged that the supporting beams or tubular members form, within their depth or otherwise, a duct or ducts for the containment of the pressurised air supply to the plenum chambers.

3. An air cushion supported load carrying pallet or platform as described in Claims 1 and 2 with a device or devices for separately controlling the volume of air flowing from a single external source to each of the plenum chambers, each device consisting of a small roller blind or other suitable moveable type of control, arranged to variably control the area of the aperture through which the air enters the plenum chamber, with means being provided for the device to be operated whilst the pallet is loaded and covered with goods or materials to be transferred, thus facilitating the alignment of the pallet or platform with the supporting surface over which the pallet is operating,by the separate control of the volume of air flowing to each of the plenum chambers.

4. A pallet or platform as claimed in any of the previous claims, wherein air under pressure, supplied from an external source, can enter the air supply ducts contained within the supporting beams or tubular members attached to the underside of the load bearing rigid sheet through one or more tube orifices, each tapered along the line of entry such that the tube bringing the air under pressure from an external source, similarly tapered concentrically with the entry tube , will mate with the entry tube and be held in position by a releasable locking device whilst the load is being moved.

5. A pallet or platform as claimed in any one of the previous Claims, with attachments located on the pallet in association with the air entry tubes , whereby a fork lift truck or similar tractor, may be releasably attached to the pallet or platform for the purpose of guiding and propelling the pallet or platform from point to point or surface to surface.

6. A pallet or platform as claimed in any one of the proceeding Claims, provided with flexible skirts in sheet form, of

reinforced plastic or rubberised, or other suitable material, with their outer perimeters being so shaped as to lie concentrically within the inner faces of the supporting beams or tubular members forming each plenum chamber and having a reinforced hem and rolled edge along its outer perimeter for attachment to the beams or tubular members , and an inner edge formed with a narrow strip of abrasive resistant material defining such area of the reactive surface over which the pallet is being moved as will for the time being form part of the plenum chamber.

7. A pallet or platform as claimed in any previous claim, with a renewable flexible skirt or skirts attached to the inner faces of the supporting beams or tubular members in each chamber, by means of of a clamp, continuous in each chamber, enclosing and securing in an airtight manner the joint between the flexible skirt and the beams or tubular members.

8. A pallet or platform as claimed in any preceding claim, upon which is mounted a framework for the purpose of supporting a waterproof cover to protect the load whilst in transit.

9. A pallet or platform as claimed in any preceding claim, upon which is mounted a rigid container for the secure protection of the goods in transit.

10. A pallet or platform as claimed in any preceding claim, upon which is mounted a refrigerated container or insulated container for the transport of chilled or frozen food.

11 A combined attachment for connecting the pallet or platform as claimed in any preceding claim, with the external supply of pressurised air, and the means of guidance and propulsion, whereby both

connections may be made simultaneously and from a remote position.

12. A pallet or platform and means of attachment substantially as described herein with reference to Figures 1-10 of the accompanying drawings.

¬Amendments to the claims have been filed as follows

1. A pallet or platform for transferring loads from one position to another position, or from one surface to another surface, whereby the surfaces may relate to the ground, the carrying surfaces of road vehicles, railway trucks, coaches , wagons, aircraft or sea going vessels, comprising a rigid sheet upon which the load is carried, beams or tubular members attached to the underside of the rigid sheet for the purpose of supporting the rigid sheet, which beams or tubular members are so arranged as to form, in part, a plurality of plenum chambers beneath the rigid sheet, each plenum chamber being defined by a flexible skirt, in sheet form, releasibly attached to the inner faces of the supporting beams or tubular members and the underside of the rigid sheet and the surface over which the pallet is operating, each plenum chamber being capable of independently receiving and containing within the chamber, compressed air, from a source of air, at a pressure greater than atmospheric pressure, located externally of the pallet, so that an independent air cushion can be formed in each plenum chamber to provide support for any load carried on the rigid sheet.

2. An air cushion supported load carrying pallet or platform as described in Claim 1, with a plurality of plenum chambers attached to the underside of the load carrying rigid sheet, each plenum chamber being defined by flexible skirts of plastic or rubberised or other suitable material, releasably attached to the supporting beams or tubular members attached to the underside of the load carrying rigid sheet and so arranged that the supporting beams or tubular members form, within their depth or otherwise, a duct or ducts for the containment of the pressurised air supply to the plenum chambers.

3. An air cushion supported load carrying pall t or platform as described in Claims 1 and 2 with a device or devices for separately controlling the volume of air flowing from a single external source to each

of the plenum chambers, each device consisting of a small roller blind or other suitable moveable type of control, arranged to variably control the area of the aperture through which the air enters the plenum chamber, with means being provided for the device to be operated whilst the pallet is loaded and covered with goods or materials to be transferred, thus facilitating the alignment of the pallet or platform with the supporting surface over which the pallet is operating,by the separate control of the volume of air flowing to each of the plenum chambers.

4. A pallet or platform as claimed in any of the previous claims, wherein air under pressure, supplied from an external source, can enter the air supply ducts contained within the supporting beams or tubular members attached to the underside of the load bearing rigid sheet through one or more tube orifices, each tapered along the line of entry such that the tube bringing the air under pressure from an external source, is similarly tapered concentrically with the entry tube , and will mate with the entry tube and be held in position by a releasable locking device whilst the load is being moved.

5. A pallet or platform as claimed in any one of the previous Claims, with attachments located on the pallet in association with the air entry tubes , whereby a fork lift truck or similar tractor, may be releasably attached to the pallet or platform for the purpose of guiding and propelling the pallet or platform from point to point or surface to surface.

6. A pallet or platform as claimed in any one of the proceeding Claims, provided with flexible skirts in sheet form, of reinforced plastic or rubberised, or other suitable material, with their outer perimeters being so shaped as to lie concentrically within the inner faces of the supporting beams or tubular members forming each plenum chamber and having its outer perimeter attached to the beams or tubular members , and an inner edge formed with a narrow strip of abrasive resistant material defining such area of the reactive surface over which the pallet is

being moved as will for the time being form part of the plenum chamber.

7. A pallet or platform as claimed in any preceding claim, upon which is mounted a framework for the purpose of supporting a waterproof cover to protect the load whilst in transit.

8. A pallet or platform as claimed in any preceding claim, upon which is mounted a rigid container for the secure protection of the goods in transit.

9. A pallet or platform as claimed in any preceding claim, upon which is mounted a refrigerated container or insulated container for the transport of chilled or frozen food.

10. A combined attachment for connecting the pallet or platform as claimed in any preceding claim, with the external supply of pressurised air, and the means of guidance and propulsion, whereby both connections may be made from a remote position by means substantially as described herein with reference to Figures 1-10 of the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number 9105397.5

Relevant Technical fields

(i) UK Cl (Edition K) B7K -KA, KC, KDC, KDX, KDA

(ii) Int Cl (Edition 5) B60V 1/00, 1/06, 1/16, B65G 7/06

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Search Examiner: B F BAXTER

Date of Search: 17 JUNE 1991

Documents considered relevant following a search in respect of claims 1-12

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	US 3055446 A VAUGHEN whole document	1
A	US 3825093 A BURDICK et at whole document	1,11
A	US 3756342 A BURDICK et al whole document	1
A	US 3796279 A BURDICK et al whole document	1
A	GB 1167426 A CLARK EQUIPMENT whole document	1,3

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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